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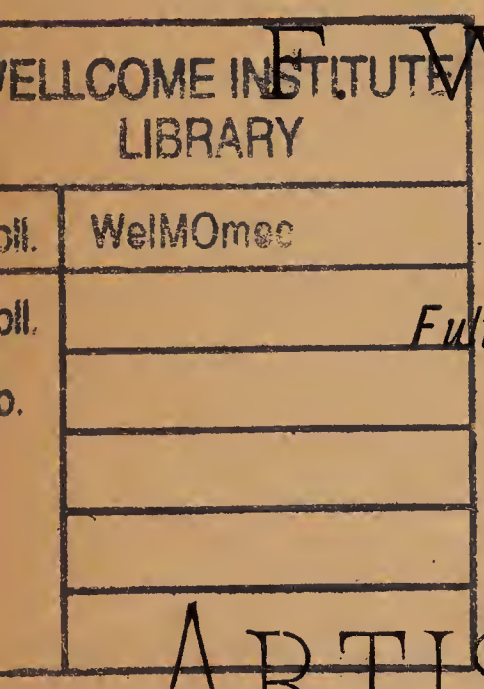

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NOTES ON CORDYLOPHORA LACUSTRIS AND MELICERTA RINGENS.

BY STEPHEN HELM.

(*Read November 14th*, 1892.)

CORDYLOPHORA LACUSTRIS.—Prof. Allman is, I believe, the only scientist who has investigated the life-history of *C. lacustris*, and although nearly forty years have elapsed since those investigations were made public, they still stand alone. This is attributable in all probability to two causes: first, the exhaustive character of that memoir; and, second, the rarity of the form itself—the former rendering observers shy of entering upon ground already so ably trodden; the latter placing a very effective barrier in the path of those who might have felt inclined to investigate had circumstances favored them.

Notwithstanding this, and the expressive and derisive representation applied to certain persons who "rush in where angels fear to tread," I am desirous of placing on record some observations made during the past summer, and I venture to hope I may be forgiven for re-introducing this form to the Society after so short an interval.

To make the present remarks clearer I am compelled to refer to my paper published in the April number of the JOURNAL, in which I speak of my anxiety to complete my observations on cer-

tain new forms therein mentioned, at the earliest possible moment. With that idea I have made repeated visits to the locality in search of specimens, although as yet without result. On one of those visits, that of July 17th, however, I took comfort to my soul, for on peering into the canal I perceived a form which, from its general aspect and enormous numbers, I at once jumped to the conclusion was my long-desired *C. coronata*. But on transferring a colony to one of my bottles for closer examination, to my amazement I found that instead of *C. coronata* I had *C. lacustris*, about the very last form I should have expected. In the paper referred to, on these two forms, I have said that after the most painstaking and diligent search I was only able to find one solitary specimen of *C. lacustris*—and that by accident—amongst the tens of thousands of *C. coronata*. But here I had before me *C. lacustris* enough to supply every microscopist in the world to his heart's content and a few millions of millions over; for although prospecting only on one side of the canal for convenience, it was, for a couple of miles at least, literally lined with it. Wherever there was a resting-place there were the tiny but beautifully branched stems of *C. lacustris*. That I was pleased, nay, delighted, goes without saying, and dreams of a thorough side-by-side comparison of the two forms rose before me, being now sure that, as I had had the good fortune to find *C. lacustris*, I should find *C. coronata* also.

Is there *any unmixed* joy in this world? I pressed the cup of joy—not canal-water—to my lips, but the pleasure was evanescent, being soon embittered by disappointment; for, after two hours' careful search, *C. coronata* was still "conspicuous by its absence." I could not find even one solitary specimen to console me. On reaching home I prepared a tank for my new capture, filling it entirely with the water obtained in this expedition—about a gallon—and looked forward to a grand distribution during the week amongst the members of the New-York Microscopical Society and other friends, even going so far as to make a careful list of those who I knew would value it. Alas! now followed my second disappointment. I had reckoned without my host. The next day my collection looked queer, and I thought it best to defer my distribution. And well it was for my friends I did so. For in three or four days *C. lacustris* was defunct and the water vile enough and black enough for Styx.

Nothing daunted, even though the weather was still very hot, I made another visit. That collection "hurried up" and went bad the following day. Again and again I tried, but, from some inexplicable cause, every gathering went in the same manner, and finally *C. lacustris* went also, gradually disappearing from the canal. I did hope to secure some germs at least, but the only result I to-night have of all these rich hauls, and after some eight or ten visits, is a piece of weed in spirit, which originally carried a few hundred forms, three to six on a stem. This I exhibit to give an idea of the enormous numbers in which it was found.

What investigations I was able to make confirmed a good many of Allman's illustrations. But I found two points of difference, otherwise the Society would have been spared a narration of my experiences.

One point of difference relates to the general position of the tentacula, which were spread in all directions and presented a free, wavy appearance, as in *C. coronata*. As shown by Allman—see April JOURNAL, plate 30—they stand almost vertical, whilst in my "solitary specimen," exhibited November 6th, 1891, they stood out like wires from a telegraph pole. Some few specimens which I was able to retain up to ten days ago had the same free, wavy appearance. Allman's presentation, however, may have been an accidental difference, produced by exceptional environments, and I do not lay much stress upon the point.

But the second point, as to the numbers of the tentacula, seems to me an important one. Allman very strangely omits to specifically state the number of tentacula, except in his description where he says, "Polypi tentaculis numerosis sparsis teretibus," thus leaving it to be inferred that, although numerous, their number is uncertain. And yet in his illustrations, of which he gives four, one, an immature form, is figured with thirteen, whilst of the three matured forms one is figured with twelve and two with thirteen. So that, to say the least, tentacula are "an uncertain quantity." But it is not unfair to Allman to assume that he considered thirteen the maximum number. Now, I found in these captures the tentacula varied in number from ten to twenty, and of these latter so many instances as to convince me that it was not an abnormal number, but quite common. However, that this statement might not go forth on my unsupported testi-

mony, I requested Dr. Pierson, my medical adviser, to count them also, and he confirmed my observations.

To sum up: This experience is certainly one of the strangest I ever passed through. Here is one form—*Cordylophora coronata*, and a new one—existing in countless millions, and for months together, in 1891, disappearing altogether in 1892; whilst the typical form *Cordylophora lacustris*, represented in 1891 by solitary specimens, appeared in 1892 in the same countless millions, but only for a few weeks. Is it possible that in these facts we have an illustration of "alternation of generations"?

MELICERTA RINGENS.—In a contribution to the *Quarterly Journal of Microscopical Science*, Philip Henry Gosse described for the first time the building-up of the tessellated tube of this lovely form of rotifer, which took place under his very eyes. Although nearly every writer on this form since that time quotes more or less from Gosse, I am not aware that any other observer has witnessed the complete operation.

I have felt a desire to do so all my life, and have searched amongst Melicertians hundreds of times, in the hope that I might be so favored, but in vain. At last, on July 26th of this year, I had the ambition of my life gratified. At 10:30 A.M. I perceived a young specimen busily engaged in this interesting occupation. Six rows of pellets had already been completed, and the young builder was still hard at work. I watched this combination of brickmaker, architect, and builder at work for five hours uninterruptedly, which I claim was, for so small and so young an operator, an unparalleled feat even amongst the hard-worked mammalians. To be sure, the object, the establishment of a home, and that for a lifetime, was a noble one, and who would not vigorously labor for such a purpose? However, dropping reflections, suffice it to say that at the expiration of these five hours the young artisan rested, evidently considering "the house" high enough for the present, and then proceeded to devote "the wheel of life" to the acquisition of food.

But what had been accomplished in these five hours? Starting with six rows of pellets at the time of first observation, twenty-one rows more were piled up, viz., fourteen rows up to 1:30 P.M., and seven more up to 3:30 P.M. These consisted, as near as I could

count, of twenty-four or twenty-five each on the average, giving a total of over five hundred pellets.

My experience confirmed that of Gosse, that the time occupied in forming a pellet averaged about one minute, for there were short intervals, as you will hear presently. The deposition was accomplished by a sudden jerking of the head, but so rapidly that I could not determine the precise instant of deposit. When we consider that the material for the formation of these pellets had to be gathered from the surrounding medium, in which scarcely a trace could be discovered—literally a case of "making bricks without straw"—it would seem a stupendous effort. All through, the same perfect order in deposition, the same delicately graduated and enlarging diameter, which we are so accustomed to admire in Melicertians, had been maintained—one more proof of the unerring instinct bestowed by the Omniscient Architect on the first Melicertian that ever built its case on these lines, and which had descended through countless generations to the one now before me.

Prof. Williamson says the first rows of these cases are deposited upon a "thin hyaline cylinder, the dilated extremity of which is attached to the supporting object." Now, with his paper and illustrations before me, I looked very carefully for this cylinder, all through the process of building, but looked in vain. A support of some kind seems essential on which to agglutinate the first pellet, and from it the first caudal row of pellets. For although adhesion to each other by means of the viscous secretion employed can be understood, they would hardly keep in position without some attachment. But, assuming the existence of this "thin hyaline cylinder," another difficulty arises, that of completing the connection between the tube and the base on which it is designed to finally rest, when the cylinder would manifestly be in the way. Gosse does not mention such a "cylinder," but the omission is accounted for by the fact that he witnessed the construction from a vertical point of view.

Whilst I entertain the highest regard for Prof. Williamson's paper and for his general erudition, I beg respectfully to say that the after-process I observed leads me to a different conclusion. When I first observed the tiny worker the lowest row of pellets was the $\frac{1}{120}$ of an inch from the base of operations. After three hours' labor in building, this had been reduced one-half. At the

expiration of five hours, and the termination of its labor, the interval had vanished altogether, and the junction of the case with the base to which the animal still adhered by its suctorial disc was complete. It seems to me that a "hyaline tube," on which the first rows of pellets are said to be deposited, must first be constructed, and that when these rows are completed it would have to be got rid of in some way, unless the intervening space were filled up by continuing to build upon it downward, which idea was not warranted by my observations.

The conclusion I am led to is that the first pellet is held in position by a temporary attachment, proceeding from its own body, in some unknown manner, and so situated as not to be in the way when its purpose is accomplished. My theory was produced by observing the singularly beautiful manner in which the tube was brought down. At short intervals the little builder ceased "making bricks," and, suddenly contracting itself upon its adhering tail, pulled the tube down with it for a short distance. By these repeated contractions and efforts the interval was gradually reduced, until the connection with the base was made and the work finished.

We have hitherto been accustomed to account for the tapering construction of the case solely by the different diameters of the body and the tail, but it is possible that a double purpose led to the conception of the design, viz., the lessening of labor in building, and the facilitation of the "pulling-down process" I have described, which latter is no doubt materially aided thereby. Of course it will be asked why the Melicertian does not solve the difficulty by laying the foundations of its tube upon the base on which it finally rests. I simply reply, I don't know. But I also add that, on October 2d, I had the pleasure of seeing another young Melicertian engaged in building, and I also observed the same interval between the caudal end of the tube and the base.

THE CAUSE OF ASIATIC CHOLERA.

BY LOUIS HEITZMANN, M.D.

(*Read October 21st*, 1892.)

Before Koch's great discovery of the "comma bacillus of cholera Asiatica" many different views were held as to the cause of cholera: first a gas theory, then a miasma theory, a soil theory, and so on, each finding its supporters. In 1884 Koch announced the fact that a "comma bacillus," or rather a "spirillum," found only in the intestines of patients and their discharges, but neither in the blood nor in any other organ, was the sole cause of the disease.

Under the microscope the comma bacillus proves to be a small, somewhat curved rod, in the fresh state often forming long curved threads, and hence its name "spirillum." It is best colored with either fuchsin or methylin blue. Microscopical examinations, however, are not conclusive. A number of other bacteria, such as Finkler and Prior's comma bacillus of cholera morbus, Deneke's comma bacillus found in cheese, Gamaleia's *Vibrio Metschnikoff* found in the intestines of fowls, or Miller's comma bacillus isolated from the mouth, can often not be differentiated, looking almost exactly alike.

Cultures are necessary for an absolutely certain differential diagnosis. Koch has shown that his comma bacillus grows on gelatin in an entirely different manner from that of the other comma bacilli. On the plate small colonies develop in from eighteen to twenty-four hours, which have a pale color, darker in the centre, with a slightly uneven contour, and soon look as if studded with particles of glass. These increase in size, and soon the gelatin commences to liquefy in the centre, forming a small funnel, the gelatin having sunk below the level of the surrounding portions. In a stick culture the same features take place. The funnel in the centre becomes larger and larger, the upper portions apparently becoming filled with an air bubble. The liquefaction of the gelatin goes along slowly, and only by about the sixth day the whole of the upper portion is liquefied.

All other comma bacilli grow differently on gelatin. Finkler

and Prior's liquefies the gelatin very quickly; Deneke's and the *Vibrio Metschnikoff* not quite as fast as Finkler and Prior's, but faster than Koch's; and Miller's not growing at all. Koch's spirillum also grows on agar-agar, milk, serum, potatoes, and, in fact, on almost any cultivating medium, if not too greatly diluted. It needs oxygen, grows best at a temperature between 60° and 105° F., is completely destroyed at a temperature of 140° F. in ten minutes, only grows on neutral or slightly alkaline media, and is soon destroyed by drying.

The last feature shows that it cannot spread through air. It can only act when introduced through the mouth into the stomach. It can be destroyed by sublimate (1: 2,000), carbolic acid (half of one per cent), chloride of lime, sulphuric acid, etc. The disease can be prevented with comparative ease. All contact with infected material must be absolutely avoided, and such material thoroughly disinfected. The hands must be kept scrupulously clean, and all water must be boiled before use. The stomach should be kept in good condition, as the comma bacillus will be destroyed in the stomach if the latter performs its functions normally.

PROCEEDINGS.

Meeting of October 7th, 1892.

The President, Mr. J. D. Hyatt, in the chair.

Twenty-eight persons present.

The Corresponding Secretary read a communication from Mr. K. M. Cunningham, dated Houston, Texas, September 29th, 1892, accompanying a donation to the Cabinet of the Society of a slide of pyritized diatoms and foraminifera, as follows:

"I forward a slide of marine diatoms and foraminifera, pyritized, or metamorphosed. They are derived from a stratified clay, at a depth of about thirty feet, in the deepening of the slip in front of the new grain elevator at Galveston, Texas. The natural submarine strata were removed by powerful suction dredges, and discharged in a continuous flow into the adjacent lowlands, with the object of securing deeper water and at the same time of reclaiming a littoral marsh for railroad purposes. In the expul-

sion of the liquid marine mud and sands, numerous large masses of the stratified clay were discharged through the twelve-inch discharge pipes, and an examination *in situ* revealed the presence of the pyritized diatoms and foraminifera. In order to put the interesting occurrence on record, I prepared a selected slide, showing about fifty of the fossilized remains, and this is the only one I had leisure to prepare. With a one-fourth objective and condensed light a pleasant and instructive study may be made of the metamorphism of forms which were once of silicious and calcareous nature.

"Putting this locality upon record extends the known area of distribution for mineralized diatoms. The earlier known specimens were from the London clay basin. Mr. Lewis Woolman's researches in the artesian-well area of the New Jersey coast have extended the subject for that locality. What I have previously put on record with your Society, for the artesian area of Mobile, Ala., has disclosed its further areal extension. And my present contribution from Galveston Bay continues the chain, to be carried on by others interested in the subject.

"I noted the following genera: *Coscinodiscus*, *Actinoptychus*, and *Campylodiscus*, but did not observe a single *Triceratium* in my limited study of the material."

Mr. Cornelius Van Brunt donated to the Cabinet a photographic negative of *Pleurosigma angulatum*, taken with a Natchet immersion, No. 7 lens, by the late Samuel Jackson. Mr. Van Brunt also placed before the Society a cabinet of one hundred and fifty microscopical slides, of the collection of Mr. Jackson, which his family now offered for sale to the Society, and stated that Mr. Jackson was one of the best preparers of microscopical objects, and, until near the time of his death, was one of the most active members of the American Microscopical Society of the City of New York. It was proposed to purchase the collection of slides for the Cabinet of the Society, the expense to be defrayed by subscription.

OBJECTS EXHIBITED.

1. Section of leaf of *Hoya carnosa*, with crystals of calcium oxalate.
2. Transverse section of stem of *Hoya carnosa*.
3. Transverse section of petiole of *Aspidestris*.

4. Pipette Filter, for the easy manipulation of hæmatoxylin, anilin green, etc.

Exhibits 1–4 by FRANK D. SKEEL.

5. Codfish, entire, three days old, from the Biological Laboratory at Wood's Holl: by H. W. CALEF.

6. Photomicrograph of the epiderm of the stem of Geranium: by CARL HEITZMANN.

7. Pyritized diatoms, from Galveston, Texas, prepared by K. M. Cunningham: by J. L. ZABRISKIE.

8. Stinging hairs of the larva of *Empretia stimulea* Clemens, the "Saddle-back Caterpillar": by J. L. ZABRISKIE.

Dr. Skeel stated, concerning his exhibit of *Hoya*, that the plant belongs to the Palm family, and that the sections were stained with anilin green, the fibro-vascular bundles taking the green, while the other structures remain unstained.

Dr. N. L. Britton referred to the great abundance of sclerotic cells in the stem of *Hoya*, and said that Dr. Northrup, using the same stain as Dr. Skeel, was examining this stem near the time of his death, attempting to find the origin and function of these sclerotic cells.

Dr. Skeel also explained the Pipette Filter contrived and exhibited by him.

Mr. F. W. Leggett gave some observations on Paradise Fish reared by him in an aquarium, remarking upon the dissimilarity of the male and female, and upon their quarrelsome disposition.

Dr. Bashford Dean stated that in 1840 a French officer brought home a pair of these fish in an ice-pitcher; that they are now abundant in the aquaria of Europe; and that they show most remarkable endurance of foul water and careless treatment.

Dr. Carl Heitzmann explained that the photomicrograph exhibited by him was taken under a power of 1,000 diameters, and illustrated the reticular structure of the protoplasm, and the so-called "intercellular connections" in the stem of Geranium, and continued as follows:

"The reticular structure of animal protoplasm I demonstrated first twenty years ago, although S. Stricker, of Vienna, succeeded two years since in reproducing the reticulum in a living, colorless, coarsely granular blood-corpuscle of a proteus, by means of the electric microscope, with a power of 2,500 diameters. In Ger-

many this fact is not yet generally acknowledged. In this country Dr. Alfred C. Stokes, of Trenton, N. J., has recently described the reticular structure of red blood corpuscles of man after treatment with dilute solution of bichromate of potash, as first discovered by Louis Elsberg twelve years ago. The same author has described the reticular structure in *Pelomyxa*, an amœboid protozoan quite common around Trenton.

"In the speaker's laboratory Mr. Maximilian Toch has studied the structure of vegetable protoplasm for more than a year, and has succeeded in photographing this structure by new methods, which he will soon publish. The specimen exhibited was treated with one-half of one per cent solution of chloride of gold, and afterward with sulphuric acid. The reticulum has assumed a dark violet color, and appears dark in the photograph. In many places numerous delicate spokes are seen traversing the cellulose, or cement substance, interconnecting the reticulum of all so-called 'cells,' and thus rendering the plant a continuous individual, from the tips of the leaves down to the ends of the rootlets. This fact was first established by Louis Elsberg in 1883. The connecting threads are far more numerous than represented by Walter Gardiner, also in 1883.

"Since in the animal organism all so-called 'cells' are of a reticular structure, and all basis and cement substances are pierced by a similar reticulum of living matter, we readily understand the fact that, after liquefaction of the basis substance, its protoplasmic condition is re-established. This happens in inflammation, as proven by the speaker in 1873. Quite recently Prof. Grawitz, of Greifswald, Germany, has rediscovered the appearance of 'cells' in the basis substance of fibrous connective tissue in inflammation, dubbing them 'slumbering cells.' The discovery is twenty years old, and was ignored in Germany for no other reason but that it proved the fallacy of the cell theory and the cellular pathology."

Prof. Edmund B. Wilson, Ph.D., of the Department of Biology, Columbia College, being introduced to the Society by Dr. N. L. Britton, related some observations on the germinal cells of *Amphioxus:* Hans van Vleich, of Zurich, observed with regard to the sea-urchin that, at the two-cell stage of the egg, if these cells were shaken apart, each cell produced an embryo of one-half the

natural size. Last summer Dr. Wilson repeated this experiment in the case of *Amphioxus*. If the two cells are simply disturbed the result will be two embryos; and so, in the four-cell stage, the result will be four embryos, showing an original connection between the cells.

Meeting of October 21st, 1892.

The Vice-President, Mr. Charles S. Shultz, in the chair.

Forty persons present.

Mr. William Wales was elected Recording Secretary *pro tem.*

The Corresponding Secretary presented a communication from Mr. K. M. Cunningham, accompanying a donation to the Cabinet of two slides of diatoms, and dated Houston, Texas, October 12th, 1892, as follows :

" Notes explanatory of two slides of diatoms :

" 1. Slide of *Terpsinoë musica* Ehrbg. On the occasion of a visit to San Antonio, Texas, in the spring of 1887, I secured a specimen of a filamentous alga from the fresh water, flushing ditches permeating the streets of San Antonio. Without knowing what I had secured, I forwarded the material to Mr. C. L. Peticolas, who returned me beautifully prepared slides of *T. musica*, and at the same time solicited a larger quantity of the material. I found it impossible to secure any one who could procure additional material from the same locality. But recently, in August, 1892, while on an excursion to San Antonio, I visited the San Pedro Springs and tested for the presence of *T. musica*. I promptly verified the fact that it grew in the greatest abundance on the water plants choking up the shallow waters of the miniature lake. I secured a rake and landed a mass of *Myriophyllum*, which I allowed to dry in the sun. This I took to Houston, and in a month or more found leisure to make a reduction for the diatoms therein.

" A little acquaintance with the diatoms occurring in this fresh-water lake enables me to tabulate the following species, which may be seen on the slide sent herewith : *Biddulphia lævis*, *Cymbella gastroides*, *C. affinis*, *Cocconeis scutellum*, *Gomphonema capitatum*, *Cymatopleura elliptica*, *Melosira crenulata*, *Navicula nobilis* and others, *Nitzschia panduriformis*, *Synedra ulna*, several species

of *Suriella*, *Stauroneis phœnicenteron*, *Terpsinoë musica*. But the slide is characterized by the richness of this last species.

"At least forty years ago Dr. Ehrenberg noted the occurrence of *T. musica* in the rivers of Texas. But only a year ago it was announced in *The Microscope*, under the warrant of a leading New Jersey diatomist in his criticism of a popular article in regard to the distribution of the various genera, that *T. musica* was an exclusively marine genus. This statement met with no denial, so far as I am aware of. The park resort at San Antonio derives its name from the San Pedro Springs, which are bold, fresh-water springs flowing from fissures in a cretaceous, fossiliferous stratum. The flow is so great that it is conducted in bridged ditches, or small canals, through the heart of the city of San Antonio, a mile and one-half distant. The little pleasure lake is, of course, fed by these springs.

"Having placed with the Society two typical representative species or varieties of that American *T. musica*, a field is presented to diatomists to make a comparative study of this genus, with a view of noting the biological divergence between the Mobile River, Ala., marsh deposit of *T. musica*, and the San Antonio *T. musica*. M. J. Tempère, editor of *Le Diatomiste*, Paris, has already in print critically classed the Mobile marsh species as being more nearly related to *T. intermedia* Pantcschek than to the ordinary type of *T. musica* Ehrbg.

"2. The other slide sent herewith is derived from an excavated lake bottom, the result of cutting a canal, or artificial 'cut-off,' to reclaim a large area of land subject to periodical inundation, and now to be filled in for railroad station grounds, at Houston, Texas. The lake traversed by the canal once formed a part of White Oak Bayou, and only in the period of high water in the bayou the bayou and lake became coterminous. In low-water periods the lake had a restricted area, containing living mussels, salamanders, etc. Through whatever period the lake may have survived, it became the receptacle for many kinds of microscopic vegetable remains and seeds, as well as a diatom deposit, surrounded on all sides by barren red and white, silicious, sandy strata.

"The slide, while containing hundreds of frustules, was predicated upon the examination of a dry clod of the earth, on the sur-

face of which just one frustule could be made out. At a second visit I found streaks in which the clay partook of the nature of a richer clay, the frustules being easily seen because densely packed.

"The interest in this deposit is somewhat intensified, as the apocryphal '*Navicula craticula*,' or '*Suriella craticula*,' is quite abundant therein, as may be noted on the slide. The other former congeners, *Navicula cuspidata* and *Stauroneis phœnicenteron*, form a majority, which characterizes the slide. Together with these there are species, such as *T. musica*, *Nitzschia circumsuta*, *Cymatopleura elliptica*, *Navicula nobilis*, *N. major*, and a number of other species, as mentioned in the list of San Pedro Springs. Gen. J. D. Cox has investigated the question of *N. craticula*, and, I believe, regarded it at one time as possibly an internal plate or an integral part of *N. cuspidata*, a matter which also interested Dr. D. B. Ward in its solution. He communicated to me, what he regarded as probable at the time, that he had found *N. craticula* in the Montgomery, Ala., fossil, fresh-water earth, where he had not at the time been able to detect *N. cuspidata*.

"Frustules of *N. craticula* occur on the Society's slide, having one-eighth the length of *N. cuspidata;* and likewise frustules of *N. craticula* as large as *N. cuspidata*. The *N. cuspidata* of this deposit are relatively very large and strongly lined, and, side by side with *Stauroneis phœnicenteron*, are very striking under study. Duplicates of either of these slides, in the hands of expert systematists, would furnish data to extend present knowledge or clear up disputed and doubtful points, as the case may be."

The Corresponding Secretary also presented an additional communication from Mr. Cunningham, accompanying a donation of packets of gravel, and dated Houston, Texas, October 14th, 1892, as follows:

"A visitor at Houston, Texas, would be at once impressed by the immense use made of a certain kind of coarse gravel as ballast for the various railroad tracks, and for surfacing the streets of the city; and, if he were a mineralogist, he would at once recognize the presence of petrified wood richly associated with this gravel. In order to place them before the Society, I have made a selection of about a dozen different specimen varieties of these very highly silicified woods. The specimens present some-

thing of structural interest even on casual examination, and they are likewise well adapted to making very fine thin rock sections. This gravel is brought from near Leadbetter, Lee Co., Texas, not far from the Colorado River, and the bulk of the gravel is of a flinty nature, seeming to be of calcareous fossil strata, altered through silicification.

"I have sent, with the fossil wood, a specimen of oölitic and foraminiferal flint, nearly equal in translucency to the chalk flints of the British coast, which can be taken as a type of the flinty gravel of the Colorado River basin.

"In another package I have sent five specimens of a cretaceous or calcareous gravel from San Antonio, Texas, where it is extensively used in the park walks and the pavements around the city. Most of this gravel is in the shape of ovoid or spherical balls, and, if broken in two, are found to be composed of concentric, spherical, concretionary layers, that may be detached continually until the central core, or nucleus, is found. In the specimens sent I have polished each face, to show the peculiar crystalline deposit, from the central nucleus to the outer margin. The two larger pieces are from the one original, and may be fitted together to illustrate the ovoid shape. Inspection suggests that thin sections, when examined with the polariscope, would give concentric radial color effects, which would prove quite interesting. I noticed that children in San Antonio played with them as marbles, using, of course, the roundest that could be found.

"These gravel specimens possibly illustrate a recomposition product of calcareous strata, as in limestone caves, and then, while in solution, redepositing upon some granule or fragment as a nucleus, and gradually augmenting by the same law of calcareous deposition indefinitely, as the balls vary from very small to very large, in the general mass of gravel as distributed. Single and double centres of concretionary action may be noted in the several specimens."

OBJECTS EXHIBITED.

1. *Micrococcus pneumonicus* Friedländer, under a Zeiss one-twelfth homogeneous immersion lens: by CHARLES S. SHULTZ.

2. *Bacillus tuberculosis*, under a Spencer one-tenth homogeneous immersion lens : by CHARLES S. SHULTZ.

3. Comma bacillus, × 900 : by LOUIS HEITZMANN.

4. The "S" form of the same, × 1,000: by LOUIS HEITZMANN.

5. Test-tube cultures of the same: by LOUIS HEITZMANN.

6. Slide of mucous membrane of a patient in Calcutta: by L. SCHÖNEY.

7. Photomicrograph of the same: by L. SCHÖNEY.

8. Radial section of the thallus of *Nostoc sphericum* Vauch: by J. L. ZABRISKIE.

9. Living specimens of the same in water: by J. L. ZABRISKIE.

Dr. Louis Heitzmann, of New York, being introduced by the Vice-President, read the paper announced on the programme, entitled "The Cause of Asiatic Cholera." This paper is published in this number of the JOURNAL, page 7.

Dr. George M. Sternberg, of Brooklyn, being introduced by the Vice-President, gave many interesting and valuable points of information on the action and prevention of cholera. He stated, with other items, that the spirillum is quickly killed by desiccation. If little squares of infected blanket are exposed to sunlight two, three, and four hours, it is found that the spirillum will grow after two hours' exposure, but not after four hours' exposure. Sunlight is one of the best disinfectants. In the late operations of the quarantine of our port many articles of clean linen were injured by the steam process, when a little sunlight would have been equally effective. In future operations, doubtless, sunlight would be much employed. With ordinary care nurses of cholera patients do not contract the disease. There is no great danger from germs wafted over in the air from an infected region.

A discussion of the subject also ensued, participated in by Dr. Carl Heitzmann, Dr. Louis Heitzmann, Dr. L. Schöney, Rev. George E. F. Haas, and others.

On motion the thanks of the Society were tendered Dr. Louis Heitzmann and Dr. George M. Sternberg for their interesting addresses.

MEETING OF NOVEMBER 4TH, 1892

The President, Mr. J. D. Hyatt, in the chair.

Twenty-six persons present.

Dr. Arthur Mead Edwards was elected a Corresponding Member of the Society.

The following Committee on Annual Exhibition was appointed by the Chair: Dr. E. G. Love, Dr. F. D. Skeel, Mr. Charles S. Shultz.

The Corresponding Secretary read a communication from Mr. K. M. Cunningham, dated Houston, Texas, October 28th, 1892, accompanying the donation of a package of tripoli, as follows:

"I forward to the Society a cabinet specimen of tripoli derived from a superficial outcrop near Navasota, Texas. After having submitted it to a micro-analysis I am able to present the following points of interest in relation thereto. The deposit presents a striking interest geologically, as it appears to be of composite origin, as developed during its analysis. Ninety per cent of the mass may be regarded as made up of what may be alumina in its most highly divided state, or, if not alumina, an amorphous silica, all of which may be completely removed by elutriation. The heavier sediment remaining is found to be volcanic glass, or some like product of igneous fusion, as indicated by its physical characters, viz., complete transparency, flat angular fragments, freedom from admixture with the ordinary silicious, rounded, and abraded grains derived from the decomposition of the azoic or granitic rocks, and whose protean distribution is known to all who have made sands a study. The particles composing this glass are further characterized as being thin plates, filled with vesicles and tubuli, which are very evident in any of the media used in an examination of the same. Examined dry (in air), the vesicles or minute bubbles are very evident, while in balsam they are nearly obliterated. Likewise the tubuli in balsam are differentiated or made quite plain, and finally become indistinct as the balsam invades the air channels of the tubuli; and if the study is made with bisulphide of carbon as a medium, the fragments and plates show with double intensity. (The bisulphide of carbon I refer to is used for patching shoes, and costs ten cents a bottle anywhere, and is called 'quick cement,' and offers a useful medium for the immediate study of diatoms, giving intense and brilliant images before evaporation takes place.)

"If it be admitted that this glass is of volcanic origin, we must necessarily recur to the conditions under which it became a part of this deposit. To do so we are brought face to face with the hypothesis of volcanic dust showers, transported through aerial

currents from distant centres of eruptive activity, and finally settling down on some aqueous area, as a gentle and intermitting rain of mineral particles, during a lengthy period of time. The deposit from which the specimen came is five feet in thickness, and is known to underlie a relatively wide area. Intimately associated with this mineral basis are several kinds of fossil organic microscopic remains, as smooth, non-tubercular, arcuate sponge spicules, crystalline spheres, intermediate in their characters between the polycistinæ and the fossil gemmules of sponges. The spheres have in some instances surface ornamentation of minute bosses, and in others short pyramidal processes or points, giving them a stellate appearance. These spherules had never hitherto been observed by me in any of the many preparations of fossil earths examined. I also saw a few discs, which may be diatoms, but they were unfamiliar shapes to me.

"Touching what has preceded, it is a matter of geological record that in the territory contiguous to the cañons of the Colorado River, and between the Rocky Mountains and Sierra Nevada, there have been observed vast deposits or strata of fresh-water infusorial origin, alternating between beds of volcanic tuffs, lava, and other phenomena of volcanic activity characterizing the struggle between the igneous and aqueous elements for supremacy, in that rock-ribbed region of the earth, now in a state of comparative quiescence. The deposit varies in its composition. Some of the material is as white as chalk and has no admixture of alumina to bind the grains together, and it can be dissipated as dust by dry brushing. When a mount of this is made it shows purely the glassy, angular plates, and nothing else. The economic value of the deposit, either as tripoli or kaolin, has not been overlooked by the commercial instinct, and a sample of the porcelain made from it, and just received from England, shows that it is not adapted to making white porcelain or chinaware, as a cube of it burned into a sort of salmon-colored, translucent glass. A previous trial of it at Pittsburg reported it as unfit for porcelain ware, on account of an oxide of iron that contaminated it."

On motion the thanks of the Society were tendered Mr. Cunningham for this donation and communication.

Mr. Stephen Helm read the paper announced on the programme,

entitled "Notes on *Cordylophora lacustris* and *Melicerta ringens*.' This paper was illustrated by objects under microscopes and by blackboard drawings, and is published in this number of the JOURNAL, page 1.

OBJECTS EXHIBITED.

1. *Octocella libertas* Helm, living: by STEPHEN HELM.
2. *Cordylophora lacustris* Allman, living: by STEPHEN HELM.
3. *Lagotia cæruleus* Helm, living: by STEPHEN HELM.
4. *Lophopus crystallinus*, living: by F. W. DEVOE.
5. Statoblasts of the same: by F. W. DEVOE.

Dr. Romyn Hitchcock, a Corresponding Member, being called upon by the President, gave some reminiscences of the time of his resident membership, and complimented the Society on its vitality and industry.

Mr. F. W. Devoe called attention to the beautiful action of the statoblasts of *Lophopus crystallinus* in his exhibit, revolving inside their gelatinous sacks by means of cilia inserted on the margin of the disc between the anchors.

Dr. F. D. Skeel explained a substage, made for him at his suggestion by the Bausch & Lomb Optical Company, consisting of a plain circular stage with clips, to be inserted at pleasure in the substage ring of the microscope, of great usefulness in operations with low powers, avoiding the extreme racking back of the body and the risk of overturning the instrument.

PUBLICATIONS RECEIVED.

The American Monthly Microscopical Journal: Vol. XIII., Nos. 9, 10 (September, October, 1892).

The Microscope: Vol. XII., Nos. 9, 10 (September, October, 1892).

The Botanical Gazette: Vol. XVII., Nos. 5—11 (May—November, 1892).

Natural Science Association of Staten Island: Proceedings, Meetings of September 10, October 15, 1892).

Bulletin of the Torrey Botanical Club: Vol. XIX., Nos. 9—11 (September—November, 1892).

Insect Life: Vol. V., Nos. 1, 2 (September, November, 1892).

Psyche: Vol. VI., Nos. 198—200 (October—December, 1892).

The Observer: Vol. III., Nos. 10, 11 (October, November, 1892).

Anthony's Photographic Bulletin: Vol. XXIII., Nos. 17--22 (September 10—November 26, 1892).

Cornell University Agricultural Experiment Station: Bulletins Nos. 42—44 (September, October, 1892).

Agricultural Experiment Station of Alabama: Bulletin No. 38 (July, 1892).

Agricultural Experiment Station of Michigan: Bulletin No. 87 (September, 1892).

Agricultural Experiment Station of Iowa: Bulletin No. 17 (May, 1892).

Agricultural Experiment Station of Texas: Bulletin No. 21 (June, 1892).

Academy of Natural Sciences of Philadelphia: Proceedings, Part II. (April—October, 1892).

Journal of the Franklin Institute: Vol. CXXXIV., Nos. 803, 804 (November, December, 1892).

Bulletin of the Essex Institute: Vol. XXIV., Nos. 4—6 (April—June, 1892).

Transactions of the Massachusetts Horticultural Society: Parts 1, 2 (1892).

The Post-Laramie Beds of Middle Park, Colorado: by the author, Whitman Cross (October, 1892).

Journal of the Royal Microscopical Society: 1892, Part 5.

International Journal of Microscopy and Natural Science: Vol. II., Part 16 (October, 1892).

Grevillea: Vol. XXI., No. 97 (September, 1892).

Proceedings of the Natural History Society of Glasgow: Vol. III., Part 2 (1892).

Penzance Natural History and Antiquarian Society: Report and Transactions (1892).

North Staffordshire Naturalists' Field Club: Report and Transactions, Vol. XXVI. (1892).

Bristol Naturalists' Society: Report and Proceedings, Vol. VII., Part 1 (1892).

The Naturalist: Nos. 206, 207 (September, October, 1892).

Canadian Record of Science: Vol. V., Nos. 3, 4 (July, October, 1892).

Geological Survey of Canada: Annual Report, Parts D, N (1891).

The Ottawa Naturalist: Vol. VI., Nos. 5—7 (September—November, 1892).

Le Diatomiste: No 10 (September, 1892).

The Victorian Naturalist: Vol. IX., Nos. 4—6 (August—October, 1892).

Australian Museum: Records, Vol. II., Nos. 2, 3 (August, 1892); Report (1892).

Naturhistorische Gesellschaft zu Nürnberg: Proceedings, Vol. IX. (1892).

Société Belge de Microscopie: Bulletin, Vol. XVIII., Nos. 8—10 (June—October, 1892); Annals, Vol. XVI. (1892).

Le Botaniste: Vol. III., Nos. 2, 3 (August, 1892).

La Notarisia: Vol. VII., No. 31 (June, 1892).

Nuovo Giornale Botanico Italiano: Vol. XXIV., No. 4 (October, 1892).

Bulletino della Società Botanica Italiana: No. 7 (1892).

Revue Internationale de Bibliographie Médicale: Vol. XIII., Nos. 15—21 (August 10—November 10, 1892).

Wissenschaftlicher Club in Wien: Monatsblätter, Vol. XIII., No. 11—

Vol. XIV., No. 1 (August—October, 1892) ; Ausserordentliche Beilage, Vol. XIV., No. 1 (1892).

L'Académie d'Hippone : Bulletin No. 24 (1888—1890); Comptes rendus (March 30, 1892).

Sociedad Científica "Antonio Alzate" : Memorias, Vol. VI., Nos. 1, 2 (1892).

Feuille des Jeunes Naturalistes : Vol. XXII., Nos. 253—263 (November, 1891—September, 1892).

The Satellite : Vol. VI., Nos. 1—3 (September—November, 1892).

Indiana Medical Journal : Vol. XI., Nos. 3—5 (September—November, 1892).

The Hahnemannian Monthly : Vol. XXVII., Nos. 10—12 (October—December, 1892).

The Brooklyn Medical Journal : Vol. VI., Nos. 10—12 (October—December, 1892).

Johns Hopkins University Circulars: Vol. XII., No. 101 (November, 1892).

The American Lancet : Vol. XVI., Nos. 9—11 (September—November, 1892).

National Druggist : Vol. XXI., Nos. 5—10 (September 1—November 15, 1892).

Mining and Scientific Review : Vol. XXIX., Nos. 9—21 (September 1—November 24, 1892).

The Weekly Bulletin : Vol. II., Nos. 59—71 (September 3—November 26, 1892).

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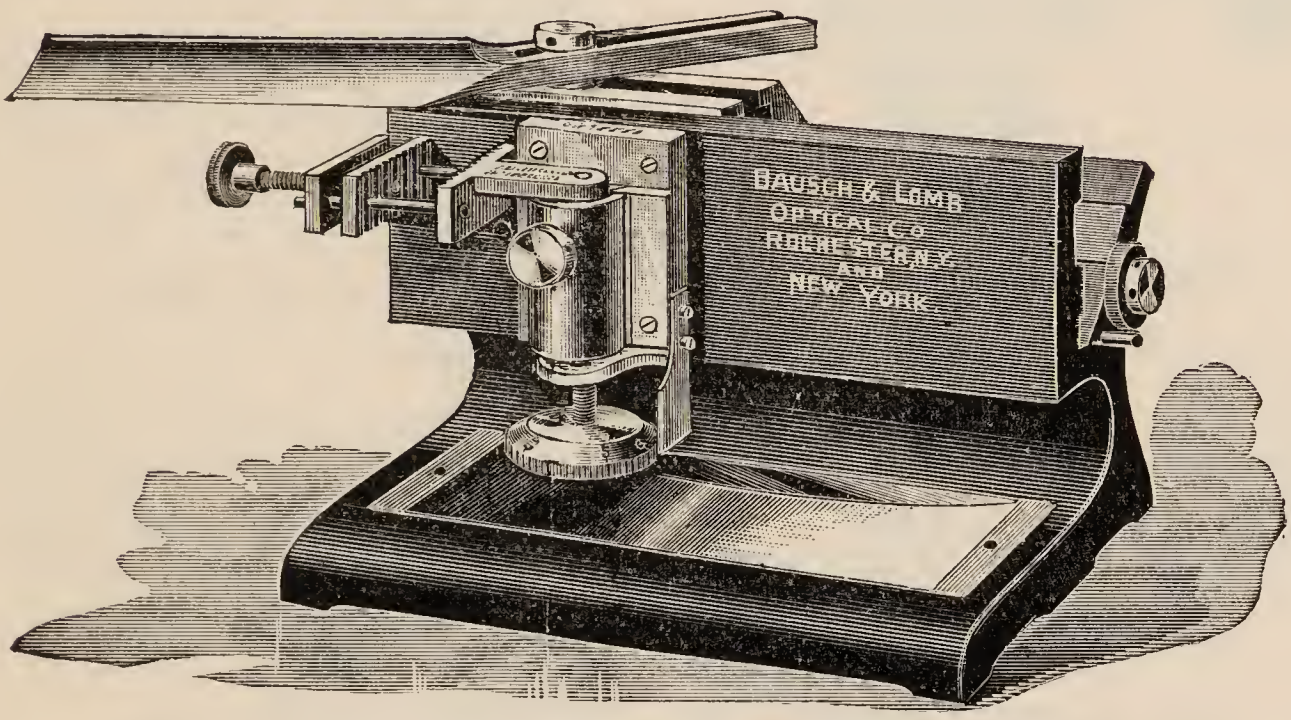

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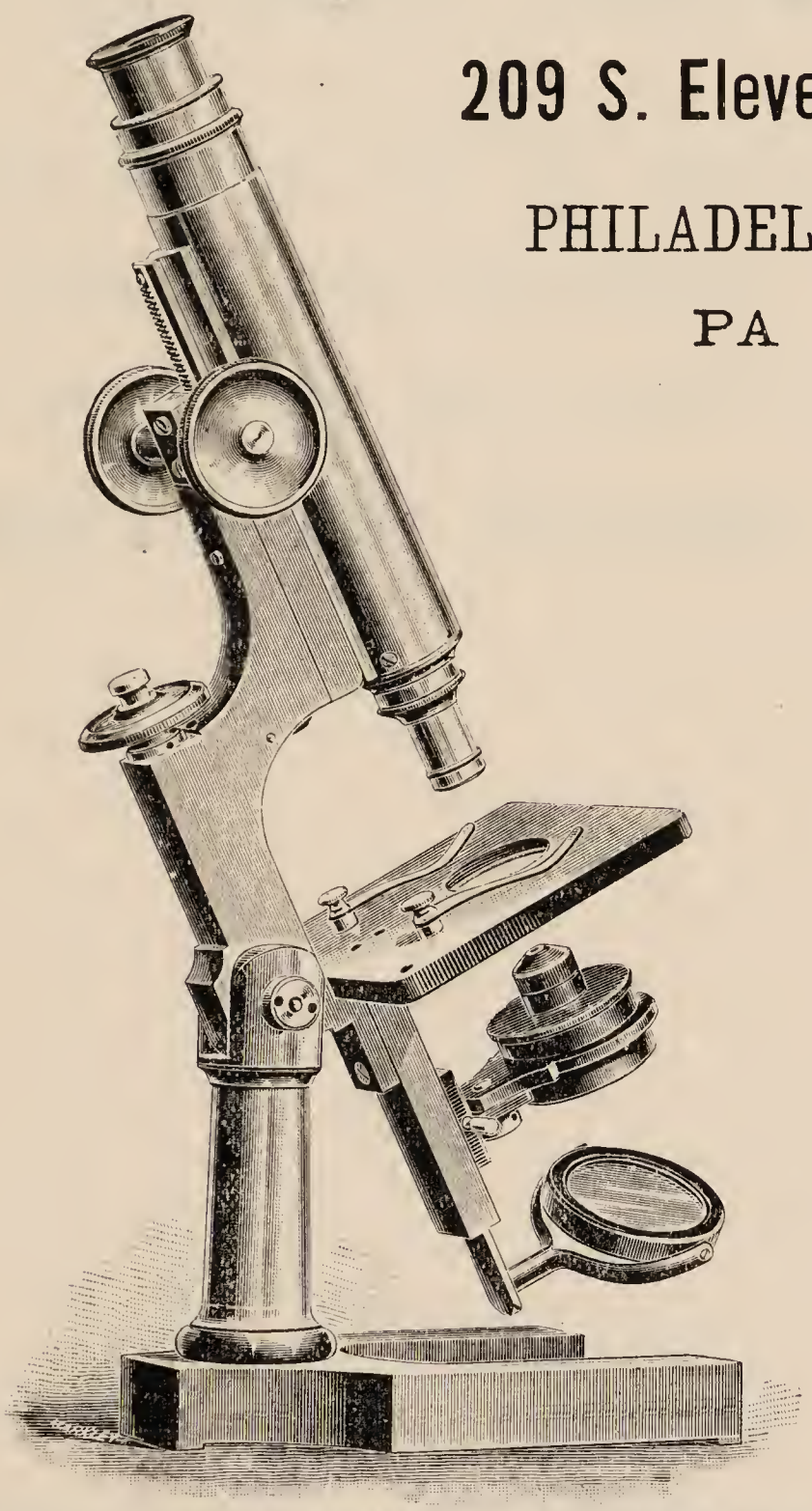

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